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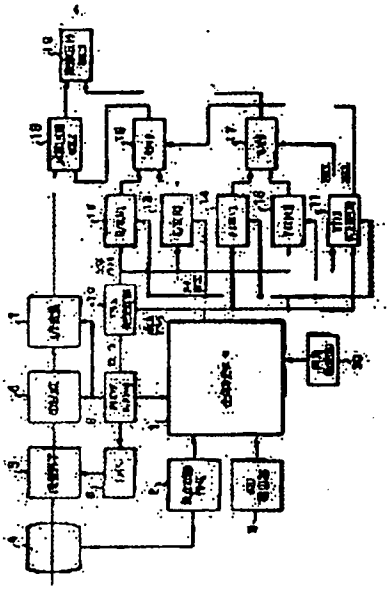
(54) IMAGE PICKUP DEVICE, IMAGE PROCESSOR, ITS METHOD, AND MEMORY MEDIUM

(57)Abstract:
PROBLEM TO BE SOLVED: To correct inequality of sensitivity of an image pickup element.
SOLUTION: This system has an image pickup element in which pixels are arrayed two-dimensionally, a first multiply circuit 18 for multiplying one- dimensional correction data in the horizontal direction to the output of the element 5 to be outputted through an A/D conversion part 7, a second multiply circuit 19 for multiplying one-dimensional correction data in the vertical direction to the multiply result, a selector 16 for selecting one-dimensional correction data in the horizontal direction, and a selector 17 for selecting one-dimensional correction data in the vertical direction to switch a selector 16 or 17 in accordance with the position (horizontal address, vertical address) of the pixel of interest.



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* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to a memory medium at image pick-up equipment, an image processing system and its approach, and a list.
[0002]
[Description of the Prior Art] Drawing 16 is drawing showing the rough configuration of the conventional digital still camera. In this digital camera, the whole control circuit 80 detects the change of state of the actuation switches (a main switch, release switch, etc.) 91, and the current supply to other the block of each is started.
[0003] Image formation of the photographic subject image of photography screen within the limits is carried out on the image pick-up side of the image pick-up section 82 through the main photography optical system 81. The image pick-up section 82 changes this image into an analog electrical signal, and supplies it to the A/D-conversion section 83 in order for every pixel. The A/D-conversion section 83 changes this analog electrical signal into a digital signal, and supplies it to the process processing circuit 84.
[0004] In the process processing circuit 84, the picture signal of each color of RGB is generated based on input data. In the condition before photography, this picture signal is periodically transmitted to video memory 89 per frame through the memory control section 85, and, thereby, an image is displayed on a display 90. This is a finder display.
[0005] On the other hand, if a photography person operates the actuation switch 91 and activation of photography is directed, according to the control signal from the whole control circuit 80, each pixel data for one frame outputted from the process processing circuit 84 will be memorized by the frame memory 86. And the data in this frame memory 86 are compressed by the memory control section 85 and the work-piece memory 87 of operating based on a predetermined compression format, and that result is memorized by external memory (for example, nonvolatile memory, such as a flash memory) 88.

[0006] Moreover, when observing an image [finishing / photography], reading appearance is carried out, the memory control section 85 develops, and the data which compressed into external memory 88 and were memorized are changed into the data for every usual photography pixel. And it is transmitted to video memory 89 and an image is displayed on a display 90 by the result.
[0007] In such a digital camera, in order to raise the photosensitivity for every pixel, the micro lens 31 as shown in drawing 2 is formed in the image sensor of the image pick-up section 32 for every photosensitive picture element part. Here, 30 is a taking lens (the main image pick-up optical system) as a field lens, and 32 is the sensitization section (light sensing portion) of an image sensor.
[0008] It becomes possible to make a photosensitive picture element part condense a surrounding light effectively by forming this micro lens 31 for every photosensitive picture element of an image sensor, when the effective sensibility field of an image sensor is narrow.
[0009] Here, as shown in drawing 2 (a), when the beam of light which let the taking lens 30 pass carries

out incidence to parallel mostly to an optical axis at an image sensor, an incident ray condenses in the sensitization section 31 that there is almost no problem. However, as shown in drawing 2 (b), when a beam of light carries out incidence to a taking lens 30 aslant, light carries out incidence of a part of original incident ray to the sensitization section 31 of a field (circumference part of an image sensor) which is separated from the optical axis of a taking lens 30 with the optical relation between a taking lens 30 and a micro lens 31.

[0010] Although lowering of such the quantity of light is generally called White shading, this phenomenon becomes intense as the pixel location on an image sensor separates from the optical axis of a taking lens 30, and is taken for the focal distance of a taking lens 30 to be on a short focus side (the distance from an image sensor side to the pupil posion of a taking lens becomes short actually), and becomes intense.

[0011] Drawing 3 is a graph showing change of White shading at the time of changing drawing of a taking lens 30, (a) extracts and an open condition and (b) express the relation between the image quantity on the image sensor in the condition of having narrowed down drawing, and relative sensibility. Thus, although relative sensibility falls greatly as compared with a part for a core as the image quantity which carries out image formation to an image sensor becomes high when drawing is in an open condition, this is because parts for many Mitsunari which carry out incidence aslant are contained in photography optical system as shown by drawing 2 (b).

[0012] On the other hand, if drawing is narrowed down, even if image quantity becomes high, change of relative sensibility will decrease. This is because a part for Mitsunari which carries out incidence to a taking lens 30 aslant according to the effectiveness of drawing is stopped.

[0013] There is an approach currently indicated by JP,9-130603,A as an approach of amending White shading generated in the combination of a taking lens 30 and the micro lens on an image sensor. By this approach, in [the location of each pixel on an image sensor] being expressed by the pointer shown in horizontal X and a perpendicular direction Y, shading compensation data [for the horizontal direction of one line] H (x) and shading compensation data [for the perpendicular direction of one line] V (y) are used. It is set as the value which becomes so large that it goes to an edge (circumference), horizontal amendment data H (i) and vertical amendment data V (j) are used to the predetermined pixel S on an image sensor (i, j), and this horizontal of one line and each shading compensation data of the perpendicular of one line are S(i, j) xH(i) xV(j) ->S' (i, j).

The becoming operation was performed and the sensibility lowering by the image sensor periphery by shading is prevented seemingly.

[0014]

[Problem(s) to be Solved by the Invention] When the same optical system (for example, interchangeable lens system) as a film-based camera conventional single lens reflex camera type is diverted and it constitutes a digital camera, the image sensor which has a quite big image pick-up field as compared with the usual image sensor is needed.

[0015] However, in an image sensor with this big image pick-up field, sensibility heterogeneity, such as a color filter generated at the time of manufacture, may pose a problem. When it sees with the whole image sensor, this cannot be amended only by making gain raise, so that lowering and lifting of sensibility arise and only some fields go on the outskirts simply selectively.

[0016] 401 of drawing 4 is an example of the sensitivity profile of an image sensor, and the sensibility for a core is expressing notionally the case of being high, compared with a circumference part. It is possible to perform extent amendment which has also used the approach of the conventional example mentioned above to such sensibility nonuniformity.

[0017] For example, 402 of drawing 4 is a thing showing the horizontal function of correction-by-sensitiveness data H (i), and the value of a correction factor is it is small and large in the circumference by part for a core. On the other hand, 403 of drawing 4 is a thing showing the function of vertical correction-by-sensitiveness data V (j), and the value of a correction factor is it is small and large in the circumference by part for a core too.

[0018] therefore, this function -- the value S of each pixel point (i, j) -- receiving -- S(i, j) xH(i) xV(j) -

>S' (i, j)
It can amend, if the becoming operation is performed.
[0019] However, when partial sensibility heterogeneity exists in two or more fields on a screen as shown in 501 of drawing 5 , by the above only using shading compensation data [for the horizontal direction of one line] H (x), and shading compensation data [for the perpendicular direction of one line] V (y) amendment approach, this sensibility heterogeneity cannot be removed thoroughly.
[0020] since [moreover,] aluminum wiring etc. is running, for example across two sensibility fields with the device structure of the image sensor shown in 601 of drawing 6 -- the field of the left-hand side in drawing -- two sensibility fields -- on the other hand (sensibility field of G) -- incident light -- falling -- reverse -- the field by the side of drawing Nakamigi -- two sensibility fields -- incident light falls to on the other hand (sensibility field of R). Therefore, the sensibility of both the sensibility field (G and R) differs by right and left of the screen area of an image sensor in the appearance shown in 602 of drawing 6 .
[0021] Similarly, in the next line (G and B are located in a line by turns), a sensitivity profile changes like 603 of drawing 6 . That is, since the BEIYA array is assumed as an array of a color filter in the case of this example, unlike the case of 602, G sensibility serves as the property of falling as it goes to right-hand side.
[0022] If a color is made with this property combining R, G, and B, a result from which tone differs by right and left and the upper and lower sides of a screen will be brought. Although this phenomenon is generally called color shading, this phenomenon is also generated with the combination of the taking lens mentioned above besides the structure of a device, and a micro lens.
[0023] To such a phenomenon, imbalance of a color cannot fully be amended only by combining amendment data stream [of the conventional single dimension] H (i), and V (j).
[0024] This invention aims at being made in view of the above-mentioned background, for example, amending the heterogeneity of the sensibility of an image sensor.
[0025] This invention aims concrete at amending the heterogeneity of the partial sensibility of the image sensor resulting from dispersion on manufacture of the color filter prepared in the image sensor etc.
[0026] Moreover, this invention aims at amending the heterogeneity (for example, color shading, White shading) of the sensibility of the image sensor resulting from the combination of the device structure of an image sensor, and image pick-up optical system.
[0027] Moreover, this invention aims at amending the heterogeneity (for example, White shading) of the sensibility of the image sensor resulting from the combination of the device structure of an image sensor, and image pick-up optical system irrespective of change of the condition of for example, photography optical system.
[0028] Other objects of this invention are indicated in the gestalt of implementation of invention.
[0029]
[Means for Solving the Problem] The image sensor with which, as for the image pick-up equipment concerning the 1st side face of this invention, the pixel was arranged two-dimensional, The 1st multiplication means which multiplies by horizontal 1-dimensional amendment data to the line of the image picturized by said image sensor, The 2nd multiplication means which multiplies by vertical 1-dimensional amendment data to the train of said image, It has a modification means to change either [at least] said horizontal 1-dimensional amendment data or the 1-dimensional amendment data of said perpendicular direction according to the location of the attention pixel in said image, and is characterized by amending the value of each pixel of said image with said 1st multiplication means and the 2nd multiplication means.
[0030] Said image is divided into two or more subregions, and, as for said modification means, it is [in / the image pick-up equipment concerning the 1st side face of this invention] desirable to change either [at least] said horizontal 1-dimensional amendment data or the 1-dimensional amendment data of said perpendicular direction according to the subregion where an attention pixel belongs.
[0031] Two or more subregions are divided and, as for said image, as for said modification means, it is [in / the image pick-up equipment concerning the 1st side face of this invention] desirable to change

the both sides of said horizontal 1-dimensional amendment data and the 1-dimensional amendment data of said perpendicular direction according to the subregion where an attention pixel belongs.
[0032] As for said modification means, it is [in / the image pick-up equipment concerning the 1st side face of this invention] desirable to have two kinds of horizontal 1-dimensional amendment data, and to present a switch and the multiplication processing by said 1st multiplication means with 1-dimensional amendment data horizontal by turns per line.
[0033] As for said modification means, it is [in / the image pick-up equipment concerning the 1st side face of this invention] desirable to have 1-dimensional amendment data of two kinds of perpendicular directions, and to present a switch and the multiplication processing by said 2nd multiplication means with vertical 1-dimensional amendment data by turns in a train unit.
[0034] As for said image sensor, it is [in / the image pick-up equipment concerning the 1st side face of this invention] desirable that the color filter of a BEIYA array is included.
[0035] In the image pick-up equipment concerning the 1st side face of this invention for example, said image Two or more pixels are respectively divided into two or more groups who consist of a field arranged two-dimensional, and each group is received. It has further the 3rd multiplication means which multiplies by the two-dimensional amendment data given in procession, and, as for said modification means, it is desirable to include a means to change said two-dimensional amendment data according to the group to whom the attention pixel in said image belongs.
[0036] As for said modification means, it is [in / the image pick-up equipment concerning the 1st side face of this invention] desirable to include a means to change either [at least] said horizontal 1-dimensional amendment data or the 1-dimensional amendment data of said perpendicular direction, according to the condition of image pick-up optical system.
[0037] As for said modification means, it is [in / the image pick-up equipment concerning the 1st side face of this invention] desirable to include a means to change either [at least] said horizontal 1-dimensional amendment data or the 1-dimensional amendment data of said perpendicular direction, according to either or such combination of the focal distance of image pick-up optical system, a field angle, and drawing.
[0038] The image processing system concerning the 2nd side face of this invention is an image processing system which processes the image supplied from the image sensor with which the pixel was arranged two-dimensional, and the line of said image is received. As opposed to the 1st multiplication means which multiplies by horizontal 1-dimensional amendment data, and the train of said image It has the 2nd multiplication means which multiplies by vertical 1-dimensional amendment data, and a modification means to change either [at least] said horizontal 1-dimensional amendment data or the 1-dimensional amendment data of said perpendicular direction according to the location of the attention pixel in said image. With said 1st multiplication means and the 2nd multiplication means, it is characterized by amending the value of each pixel of said image.
[0039] As opposed to the line of the image by which the image-processing approach concerning the 3rd side face of this invention is picturized with the image sensor by which the pixel was arranged two-dimensional As opposed to the 1st multiplication process which multiplies by horizontal 1-dimensional amendment data, and the train of said image The 2nd multiplication process which multiplies by vertical 1-dimensional amendment data, and the modification process which changes either [at least] said horizontal 1-dimensional amendment data or the 1-dimensional amendment data of said perpendicular direction according to the location of the attention pixel in said image are included. According to said 1st multiplication process and the 2nd multiplication process, it is characterized by amending the value of each pixel of said image.
[0040] The memory medium concerning the 4th side face of this invention is a memory medium which stored the image-processing program. This program As opposed to the line of the image picturized by the image sensor by which the pixel was arranged two-dimensional As opposed to the 1st multiplication process which multiplies by horizontal 1-dimensional amendment data, and the train of said image The 2nd multiplication process which multiplies by vertical 1-dimensional amendment data, and the modification process which changes either [at least] said horizontal 1-dimensional amendment data or

the 1-dimensional amendment data of said perpendicular direction according to the location of the attention pixel in said image are included. According to said 1st multiplication process and the 2nd multiplication process, it is characterized by amending the value of each pixel of said image.

[0041]

[Embodiment of the Invention] [Gestalt of the 1st operation] drawing 1 is the block diagram showing the configuration of the camera (image pick-up equipment) concerning the gestalt of suitable operation of this invention. One is the whole control CPU which manages control of the whole camera among drawing. 2 is a focal distance detecting element for detecting the focal distance (or pupil posion of photography optical system) of the photography optical system of a camera, outputs the encoding information corresponding to a focal distance, and transmits it to CPU1. 3 is a drawing detecting element which detects the condition of drawing within photography optical system, outputs the encoding information corresponding to the condition of drawing, and transmits it to CPU1.

[0042] 4 is the main photography optical system (image pick-up lens) of a camera. 5 is an image sensor which changes and outputs the optical information which is the photographic subject image by which image formation is carried out to an electrical signal according to the main photography optical system 4, for example, consists of charge coupled devices, such as CCD.

[0043] Reading appearance of the charge accumulated with the image sensor 5 into predetermined time is carried out to order for every pixel, and it is supplied to CDS / AGC circuit 6 of the next step, and after noise components, such as a reset noise generated in the image sensor itself here, are reduced and being amplified to suitable level, it is supplied to the A/D-conversion section 7. In the A/D-conversion section 7, the photographic subject brightness information equivalent to the amount of charges is changed into digital data. Here, since the optical color filter for making each chrominance signal, such as RGB, etc. is sticking on the image sensor 5, the output signal from an image sensor 5 turns into a signal which shows each color by turns, and appears.

[0044] 8 is a driver circuit for driving an image sensor 5 actually, and supplies a driving pulse to an image sensor 5 a fixed period based on the timing signal supplied from the timing generator circuit 9.

[0045] Moreover, the timing generator circuit 9 generates Horizontal Synchronizing signal HD and Vertical Synchronizing signal VD, and supplies this to a address generation circuit 10. A address generation circuit 10 generates the address signal for supplying the memory 12-15 connected with the next step based on Horizontal Synchronizing signal HD and Vertical Synchronizing signal VD.

[0046] 12-15 are memory which has memorized the data for performing correction by sensitiveness of an image sensor. the H memory H which has more specifically memorized the 1st amendment data with horizontal 12 -- the H memory H which has memorized the 2nd amendment data with horizontal 1 and 13 -- the V memory V 2 and 14 have remembered the vertical 1st amendment data to be -- 1 and 15 are the V memory V2 which has memorized the vertical 2nd amendment data.

[0047] 11 is an address distinction circuit and outputs the selection signal VSEL for choosing the selection signal HSEL for choosing memory 12 or 13 based on the signal supplied from a address generation circuit 10 and memory 14, or 15.

[0048] 16 and 17 choose memory 12 or 13, memory 14, or the output of 15 based on the selection signals HSEL and VSEL supplied from the address distinction circuit 11, respectively.

[0049] 18 is the 1st multiplication circuit (MUL1), and performs multiplication processing with the output of the A/D-conversion section 7, and the horizontal amendment data obtained through a selector 16. 19 is the 2nd multiplication circuit (MUL2), and performs multiplication processing with the output of the 1st multiplication circuit (MUL1) 18, and the amendment data of the perpendicularly it is obtained through a selector 17.

[0050] It is inputted for example, into a process processing circuit, dark level amendment, gamma conversion, color interpolation processing, etc. are performed here, and the output value from the 2nd multiplication circuit (MUL2) 19 is memorized by memory etc. after that.

[0051] Here, this color interpolation processing is explained, referring to drawing 7 . The pixel array (array of a color filter) of the image sensor shown in drawing 7 is a general BEIYA array, and is the check of G, and a R/B line sequential array. Since the information on RGB is not in all pixels in the case

of the image sensor of the veneer, it is common that the interpolation operation which used the matrix of 3x3 shown in the center of drawing 7 , for example generates the RGB color information corresponding to each pixel location on an image sensor.

[0052] In drawing 7 , although the interpolation filter of G differs from the interpolation filter of R/B, G data of the location of a are generated by multiplying the multiplier of the interpolation filter of G by the pixel in field a', i.e., the pixel of the location of a, and each brightness data of 8 pixels of the perimeter, respectively, for example. In the case of drawing 7 , the multiplier to the brightness data of the location of a corresponding to the color filter of G is 1, the multiplier which receives vertically and horizontally is 0.25, but since G data of the location of these four directions are 0, G data are substantially determined only with the output value of the location of a.

[0053] On the other hand, G data of the location of b are generated by multiplying the multiplier of the interpolation filter of G by the pixel in field b', i.e., the pixel of the location of b, and each brightness data of 8 pixels of the perimeter, respectively. In this case, since G data of the location of b are 0, G data in the location of b are determined by the average value of G data of those four directions.

[0054] Similarly, about R/B, the interpolation filter of different R/B from the interpolation filter of G is used, and the R/B data to a total pixel location is determined. Thus, eventually, the data of RGB [as opposed to / like / a total pixel location] shown in the right end of drawing 7 are generable.

[0055] Next, amendment ****** in the camera shown in drawing 1 is explained using drawing 5 , drawing 8 , and drawing 9 .

[0056] Drawing 8 is a flow chart which shows the processing which performs initial setting of the data of the address distinction circuit 11 in the H memory (H1) 12, the H memory (H2) 13, the V memory (V1) 14, and V memory (V2) 15 list from the whole control CPU 1.

[0057] At step 24, the 1-dimensional data stream H1 (i) as shown in 502 of drawing 5 is first set up to the H memory (H1) 12 (storing). Next, at step 25, the 1-dimensional data stream H2 (i) as shown in 503 of drawing 5 is set up to the H memory (H2) 13 (storing). These two data streams H1 (i) and H2 (i) are mutually different data. These data are determined according to the property of the image sensor 5 measured in the production process, and are beforehand stored in the nonvolatile memory inside the whole control CPU 1 etc. Here, i shows the level address. In 501 of drawing 5 , the left is the address by the side of the low order of the level address.

[0058] Similarly, in step 26, the 1-dimensional data stream V1 (j) as shown in 504 of drawing 5 is set up to the V memory (V1) 14 (storing), and the 1-dimensional data stream V2 (j) as shown in 505 of drawing 5 is set up to the V memory (V2) 15 at step 27 (storing). It is mutually different data, and it is determined according to the property of the image sensor 5 measured on the production process, and these two data streams V1 (j) and V2 (j) are beforehand stored in the nonvolatile memory inside the whole control CPU 1 etc. Here, j shows the vertical address. In 501 of drawing 5 , above is the address by the side of the low order of the vertical address.

[0059] As for the pixel of an image sensor 5, a location is pinpointed by the level address i and the vertical address j. This level address i and the vertical address j are generated in a address generation circuit 10 according to Horizontal Synchronizing signal HD and Vertical Synchronizing signal VD.

[0060] Next, at steps 28 and 29, the value of the distinction conditions in the case of distinguishing the vertical address is set as the level address list generated in a address generation circuit 10 in the address distinction circuit 11 of drawing 1 .

[0061] At step 28, the whole control CPU 1 transmits level address Halpha as shown in 501 of drawing 5 to the address distinction circuit 11 as level address distinction data, and the whole control CPU 1 transmits Vbeta as shown in 501 of drawing 5 to the level address address distinction circuit 11 as vertical address distinction data in step 29. These two data Halpha and Vbeta are also determined according to the property of the image sensor 5 surveyed by the production process, and it is beforehand stored in the nonvolatile memory inside the whole control CPU 1 etc.

[0062] Next, it explains in the 1st multiplication circuit (MUL1) 18 and the 2nd multiplication circuit (MUL2) 19, referring to drawing 9 about the change of the amendment data at the time of amending to the data outputted from the A/D-conversion circuit 7. Drawing 9 is a flow chart which shows the address

distinction processing in the address distinction circuit 11.
[0063] In this example, as shown in 501 of drawing 5 , the sensibility for a center section of the 1st field of an image sensor 5 and the 3rd field is high by dispersion at the time of manufacture of a color filter etc. In order to amend this sensitivity profile, a data stream with the small value of the correction factor corresponding to a part with high sensibility and the large value of the correction factor corresponding to a part with low filter sensibility is used.
[0064] At steps 30, 31, and 36 of drawing 9 , the location of the data (pixel) outputted now distinguishes to which field in the service area of the image sensor 5 which consists of the 1st thru/or the 4th field it belongs based on the level address i and the vertical address j from the A/D-conversion section 7.
[0065] first, it distinguishes from that whose data concerned the vertical address is smaller than Vbeta, and are data of the 1st field of 501 of drawing 5 when the level address is smaller than Halpha, and the selection signal HSEL which is an output signal of the address distinction circuit 11 is set as L level in steps 32 and 33 -- both the selection signals VSEL are set as L level. By this, it lets a selector 16 pass, while the amendment data H1 (i) stored in the H memory (H1) 12 are supplied to the 1st multiplication circuit (MUL1) 18, it will let a selector 17 pass, and the amendment data V1 (j) stored in the V memory (V1) 14 will be supplied to the 2nd multiplication circuit (MUL2). The amendment processing in this case is as follows.
[0066] In the 1st field, the multiplication of the horizontal amendment data H1 corresponding to the level address i (i) is first carried out in the 1st multiplication circuit (MUL1) 18 to the data outputted from the A/D-conversion circuit 7. Amendment (the 1st-step amendment) of a horizontal sensitivity profile is performed thereby first. In the 1st field, since the sensibility for the center section is high, as shown in 502 of drawing 5 , as horizontal amendment data H1 (i), a data stream with the correction factor of a part with the high sensibility of an image sensor 5 smaller than the correction factor of other parts is used.
[0067] Subsequently, in order to amend the sensitivity profile of the perpendicular direction of the 1st field, the multiplication of the amendment data V1 of the perpendicular direction corresponding to the vertical address j (j) is carried out to the output of the 1st multiplication circuit (MUL1) 18 by the 2nd multiplication circuit (MUL2) 19 (the 2nd-step amendment). This amendment data V1 (j) lets a selector 17 pass, and is supplied to the 2nd multiplication circuit (MUL2) 19 from the V memory (V1) 14. As the amendment data V1 (j) are shown in 504 of drawing 5 , the sensibility of an image sensor 5 is a data stream with the correction factor of a high part smaller than the correction factor of other parts.
[0068] Thus, with the gestalt of this operation, partial correction by sensitiveness in the 1st field is realized by carrying out the multiplication of the horizontal 1-dimensional amendment data H1 (i) and the vertical 1-dimensional amendment data V1 (j) to each pixel of the 1st field, respectively.
[0069] Moreover, in the distinction processing by steps 30, 31, and 36 of drawing 9 , the vertical address corresponding to the data (pixel) outputted from the A/D-conversion section 7.now is smaller than Vbeta, and when the level address is more than Halpha, it is also distinguished that the data concerned are data of the 2nd field. In this case, in steps 34 and 35, while the selection signal HSEL which is an output signal of the address distinction circuit 11 is set as L level, a selection signal VSEL is set as H level. By this, it lets a selector 16 pass, while the amendment data H1 (i) stored in the H memory (H1) 12 are supplied to the 1st multiplication circuit (MUL1) 18, it will let a selector 17 pass, and the amendment data V2 (j) stored in the V memory (V2) 15 will be supplied to the 2nd multiplication circuit (MUL2). The amendment processing in this case is as follows.
[0070] As this example shows to 501 of drawing 5 , the sensitivity profile of the 2nd field is flat. Therefore, about the data of the 2nd field, the level address carries out horizontal amendment among the amendment data H1 of 502 of **5** (i) using the part more than Halpha, i.e., a part with a flat property. That is, about the 2nd field, horizontal amendment is first performed in the 1st multiplication circuit (MUL1) 18 to the data outputted from the A/D-conversion section 7 by carrying out the multiplication of the horizontal amendment data H1 corresponding to the level address i (i) (the 1st-step amendment).
[0071] Moreover, as mentioned above, since the sensitivity profile of the 2nd field is flat, the vertical address amends perpendicularly among the amendment data H2 of 505 of drawing 5 (j) using the part of

under Vbeta, i.e., a part with a flat property. That is, subsequently to the 1st-step amendment about the 2nd field, the multiplication of the amendment data V2 of the perpendicular direction corresponding to the vertical address j (j) is carried out by the 2nd multiplication circuit (MUL2) 19 (the 2nd-step amendment).

[0072] As mentioned above, in the 2nd field, since different 1-dimensional amendment data V2 from the 1st field (j) are used as vertical 1-dimensional amendment data, when sensibility nonuniformity is in the 1st field, amendment which suited the sensitivity profile of the 2nd field can be performed.

[0073] Moreover, in the distinction processing by steps 30, 31, and 36 of drawing 9 , above Vbeta, the vertical address corresponding to the data (pixel) outputted from the A/D-conversion section 7 now is distinguished from that whose data concerned are data of the 3rd field, when the level address is smaller than Halpha. In this case, in steps 37 and 38, while the selection signal HSEL which is an output signal of the address distinction circuit 11 is set as H level, a selection signal VSEL is set as L level. By this, it lets a selector 16 pass, while the amendment data H2 (i) stored in the H memory (H2) 13 are supplied to the 1st multiplication circuit (MUL1) 18, it will let a selector 17 pass, and the amendment data V1 (j) stored in the V memory (V1) 14 will be supplied to the 2nd multiplication circuit (MUL2). The amendment processing in this case is as follows.

[0074] As this example shows to 501 of drawing 5 , the sensitivity profile of the 3rd field is flat. Therefore, about the data of the 3rd field, the level address carries out horizontal amendment among the amendment data H2 of 503 of **5** (i) using the part of under Halpha, i.e., a part with a flat property. That is, about the 3rd field, horizontal amendment is first performed in the 1st multiplication circuit (MUL1) 18 to the data outputted from the A/D-conversion section 7 by carrying out the multiplication of the horizontal amendment data H2 corresponding to the level address i (i) (the 1st-step amendment).

[0075] Moreover, as mentioned above, since the sensitivity profile of the 3rd field is flat, the vertical address amends perpendicularly among the amendment data H1 of 504 of drawing 5 (j) using the part more than Vbeta, i.e., a part with a flat property. That is, subsequently to the 1st-step amendment about the 3rd field, the multiplication of the amendment data V1 of the perpendicular direction corresponding to the vertical address j (j) is carried out by the 2nd multiplication circuit (MUL2) 19 (the 2nd-step amendment).

[0076] As mentioned above, in the 3rd field, since different 1-dimensional amendment data H2 from the 1st field (i) are used as horizontal 1-dimensional amendment data, when sensibility nonuniformity is in the 1st field, amendment which the sensitivity profile of the 3rd field suited can be performed.

[0077] Moreover, in the distinction processing by steps 30, 31, and 36 of drawing 9 , above Vbeta, the vertical address corresponding to the data (pixel) outputted from the A/D-conversion section 7 now is distinguished from that whose data concerned are data of the 4th field, when the level address is more than Halpha. In this case, in steps 39 and 40, while the selection signal HSEL which is an output signal of the address distinction circuit 11 is set as H level, a selection signal VSEL is set as H level. The amendment processing in this case is as follows.

[0078] As this example shows to 501 of drawing 5 , the 4th field has the high sensibility for that center section. Therefore, about the 4th field, the part into which the level address has a property smaller than the part more than Halpha, i.e., the part of others [correction factor / of a part with this high sensibility], is used among the amendment data H2 of 503 of drawing 5 (i). That is, about the 4th field, horizontal amendment is first performed in the 1st multiplication circuit (MUL1) 18 to the data outputted from the A/D-conversion section 7 by carrying out the multiplication of the horizontal amendment data H2 corresponding to the level address i (i) (the 1st-step amendment).

[0079] moreover -- since the 4th field has the high sensibility for the center section as mentioned above -- the inside of the amendment data H2 of 505 of drawing 5 (j) -- the vertical address -- the part of under Vbeta -- namely, -- that is, the part which has the property that the correction factor of a part with this high sensibility is smaller than other parts is used. That is, subsequently to the 1st-step amendment about the 2nd field, the multiplication of the amendment data V2 of the perpendicular direction corresponding to the vertical address j (j) is carried out by the 2nd multiplication circuit (MUL2) 19 (the 2nd-step amendment).

[0080] As mentioned above, in the 4th field, amendment which suited the sensitivity profile of the 4th field can be performed by being related horizontally, using different 1-dimensional amendment data H2 from the 1st and 2nd fields (i), and using different 1-dimensional amendment data V2 from the 1st and 3rd fields (j) about a perpendicular direction.
[0081] The partial sensibility nonuniformity of the image sensor resulting from nonuniformity, such as a color filter produced in a production process, etc. may be produced in two or more parts in the service area of an image sensor. Such a problem increases in connection with large-area-izing an image sensor. In order to raise the yield of an image sensor, it is important to amend such sensibility nonuniformity.
[0082] Then, the partial sensibility nonuniformity which may be generated in two or more fields of an image sensor can be amended, without having at least two or more kinds of horizontal 1-dimensional amendment data, having at least two or more kinds of vertical 1-dimensional amendment data like the gestalt of this operation, and having amendment data for one screen by [these] using selectively.
[0083] although two Halpha and Vbeta are used with the gestalt of the above-mentioned operation as the address which switches amendment data -- the increase of this number -- you may carry out.
[0084] For example, the horizontal address used as the boundary of the 1st field and the 2nd field is set to Halpha1. It is good also considering the address of the perpendicularly which the address of the perpendicularly which it is perpendicularly good also as Halpha2, and serves as a boundary of the 1st field and the 3rd field similarly in the horizontal address used as the boundary of the 3rd field and the 4th field is set to Vbeta1, and serves as a boundary of the 2nd field and the 4th field as Vbeta2.
[0085] Moreover, the service area of an image sensor may be divided into finer subregion, and the suitable 1-dimensional amendment data for each subregion may be assigned as it divides into nine by trichotomizing the service area of an image sensor 5 horizontally, and, for example, trichotomizing perpendicularly.
[0086] As explained above, according to the gestalt of this operation, the sensibility field of an image sensor is divided into two or more fields, and the output of an image sensor is amended combining one at least two horizontal amendment data of the 1-dimensional amendment data, and one amendment data of the 1-dimensional amendment data of at least two perpendicular directions for every field, for example. Proper correction by sensitiveness can be performed without having amendment data according to an individual about all pixels, when two or more partial sensibility nonuniformity resulting from the sensibility nonuniformity of a color filter etc. exists in an image sensor by this.
[0087] The gestalt of operation of the 2nd of this invention is explained referring to [gestalt of the 2nd operation] drawing 6 , drawing 10 , and drawing 11 . In addition, the gestalt of the 1st operation shall be followed here about the matter which does not make reference.
[0088] The incoming beams to an image sensor 5 become slanting, so that it goes to the circumference part of an image sensor 5, when it has device structure (cross section) as an image sensor 5 shows to 601 of drawing 6 . Therefore, it can be said that it is in the amount of incident light about a difference between adjacent pixels. This phenomenon becomes more remarkable, as it separates from an optical axis, and is generated on the both sides of horizontal and a perpendicular direction.
[0089] When it thinks in a direction parallel to the direction of the cross section of 601, as shown in 602 and 603 of drawing 6 , the sensibility (output) of the pixel group which counts from an edge and is located in an odd number, and the sensibility (output) of the pixel group located in an even number completely have a reverse property. If a horizontal direction and a perpendicular direction are structures like 601 both, a horizontal direction and a perpendicular direction will differ [the oddth] in a property from the eventh as mentioned above.
[0090] Therefore, with the gestalt of this operation, in order to amend this property, according to whether the location (address) of that pixel is the horizontal oddth, whether it is the eventh, whether it is the oddth of a vertical position, and whether it is the eventh, an amendment property is changed to the output data of an image sensor 5.
[0091] Drawing 10 is a flow chart which shows the processing in the address distinction circuit 11 shown in drawing 1 .
[0092] First, at steps 45, 46, and 51, the address distinction circuit 11 performs distinction processing

based on the horizontal and the vertical address which are outputted from a address generation circuit 10 corresponding to the data (pixel) outputted from the A/D-conversion section 7. And the number of the vertical addresses j of the data (pixel) by which the current output is carried out from the A/D-conversion section 7 is odd (namely, the oddth line in the array of the two-dimensional image sensor 5), and, in the case of odd number (namely, eye an odd number train in the array of the two-dimensional image sensor 5), the level address i advances processing to step 47.

[0093] At step 47, the address distinction circuit 11 sets a HSEL output as L level. Consequently, the data array H1 (i) of the H memory (H1) 12 is supplied to the 1st multiplication circuit (MUL1) 18 through a selector 16. Next, at step 48, the address distinction circuit 11 sets a VSEL output as L level. Consequently, the data array V1 (j) of the V memory (V1) 14 is supplied to the 2nd multiplication circuit (MUL2) 19 through a selector 17.

[0094] This condition is explained with reference to drawing 11 . In addition, 1101 shows typically the two-dimensional array of the photo detector in an image sensor 5. When the attention pixel at this time is pixel 1101a of G on the leftmost of drawing 11 , the data of pixel 1101a are amended according to level and the property of the horizontal amendment data H1 (i) shown as the continuous line of 1102 of drawing 11 in the 1st multiplication circuit (MUL1) 18 when the number of both the vertical addresses i and j is odd. Moreover, in the 2nd multiplication circuit (MUL2) 19, the data of pixel 1101a are further amended in accordance with the property of the amendment data V1 of the perpendicularly it is shown as the continuous line of 1104 of drawing 11 (j).

[0095] Next, the case where an attention pixel is (Pixel R) 1101b of the next door of pixel 1101a is considered. In this case, since the number of the level addresses i is even and that of the vertical addresses j is odd, first, it is step 49 and, as for the address distinction circuit 11, a HSEL output is set as H level. Consequently, the data array H2 (i) of the H memory (H2) 13 is supplied to the 1st multiplication circuit (MUL1) 18 through a selector 16. Subsequently, at step 50, the address distinction circuit 11 sets a VSEL output as L level. Consequently, the data array V1 (j) of V memory (V1) is supplied to a multiplication circuit (MUL2) through a selector 17.

[0096] This condition is explained with reference to drawing 12 . First, in the 1st multiplication circuit (MUL1) 18, pixel 1101b is amended according to the property of the horizontal amendment data H2 (i) shown by the dotted line of 1102 of drawing 11 . Moreover, in the 2nd multiplication circuit (MUL2) 19, pixel 1101b is further amended according to the property of the amendment data V1 of the perpendicularly it is shown as the continuous line of 1105 of drawing 11 (j).

[0097] thus, G(1101a) ->R(1101b) ->G->R-> of the line of the top of 1101 of drawing 11 -- about ..., amendment data are chosen as mentioned above and amendment is made.

[0098] Next, since the number of the vertical addresses j is even first with the 2nd line from 1101 of drawing 11 about (Pixel B) 1101c on the left-hand side of No. 1 and that of the level addresses i is odd, first, it is step 52 and, as for the address distinction circuit 11, HSEL is set as L level. Consequently, the data array H1 (i) of the H memory (H1) 12 is supplied to the 1st multiplication circuit (MUL1) 18 through a selector 16. Next, at step 53, the address distinction circuit 11 sets VSEL as H level. Consequently, the data array V2 (j) of the V memory (V2) 15 is supplied to the 2nd multiplication circuit (MUL2) 19 through a selector 17.

[0099] Drawing 11 is referred to and this condition is explained. First, in the 1st multiplication circuit (MUL1) 18, pixel 1101c is amended according to the property of the horizontal amendment data H1 (i) shown as the continuous line of 1103 of drawing 11 . Moreover, in the 2nd multiplication circuit (MUL2) 19, pixel 1101c is further amended according to the property of the amendment data V2 of the perpendicularly it is shown by the dotted line of 1104 of drawing 11 (j).

[0100] Next, the case where an attention pixel is (Pixel G) 1101d of the next door of pixel 1101c is considered. In this case, since both the level address i and the vertical address j become even number, first, it is step 54 and, as for the address distinction circuit 11, HSEL is set as H level. Consequently, the data array H2 (i) of the H memory (H2) 13 is supplied to the 1st multiplication circuit (MUL1) through a selector 16. Subsequently, at step 55, the address distinction circuit 11 sets VSEL as H level. Consequently, the data array V2 (j) of the V memory (V2) 15 is supplied to the 2nd multiplication

circuit (MUL2) 19 through a selector 17.
[0101] This condition is explained with reference to drawing 11 . First, in the 1st multiplication circuit (MUL1) 18, 1101d of pixels is amended according to the property of the amendment data H2 (i) shown by the dotted line of 1103 of drawing 11 . Moreover, in the 2nd multiplication circuit (MUL2) 19, pixel 1101c is further amended according to the property of the amendment data V2 (j) shown by the dotted line of 1105 of drawing 11 .
[0102] Thus, about B(1101c) ->G(1101d) ->B->G->B-> of the 2nd line, amendment data are chosen from on 1101 of drawing 11 as mentioned above, and amendment is made.
[0103] As mentioned above, according to the gestalt of this operation, color shading by the difference in the amount of incident light between the contiguity pixels in the image sensor of device structure like 1101 of drawing 6 can be prevented by switching vertical amendment data by whether the number of a switch and the vertical addresses is even about horizontal amendment data, or the number is odd by whether the number of the level addresses is even, or the number is odd.
[0104] Although two kinds of 1-dimensional amendment data were used about horizontal and a perpendicular direction with the gestalt of the above-mentioned operation, respectively, this invention is not limited to this. For example, 1 or two or more amendment data may be used for every R, G, and B, respectively. Moreover, for example, when adopting the color filter of a complementary color system as a color filter, four kinds of amendment data may be used about each horizontal and vertical direction.
[0105] According to the gestalt of this operation, while carrying out the group division (for example, even lines, odd lines) of the level line according to arrangement of the device structure of an image sensor, and image pick-up optical system, for example By carrying out the group division (for example, even lines, odd lines) of the vertical lines, and amending the output of an image sensor to each group with the application of the 1-dimensional amendment data according to individual Color shading produced with the combination of the device structure of an image sensor and photography optical system can be amended.
[0106] With reference to [the gestalt of the 3rd operation] next drawing 12 , drawing 13 , and drawing 14 , the gestalt of operation of the 3rd of this invention is explained.
[0107] The gestalt of this operation is related with the amendment approach for removing to accuracy both sensibility nonuniformity produced by dispersion on White shading produced with the combination of the main photography optical system and the micro lens on an image sensor, and manufacture of the color filter on an image sensor.
[0108] Drawing 12 is the block diagram showing the configuration of the camera (image pick-up equipment) concerning the gestalt of operation of the 3rd of this invention. To the configuration of the camera shown in drawing 1 , this camera adds the HV memory 20 and the 3rd multiplication circuit (MUL3) 21, and has the configuration which deleted the H memory (H2) 13, the V memory (V2) 15, the address distinction circuit 11, and selector circuits 16 and 17.
[0109] As shown in drawing 13 , the HV memory 20 defines the block for every predetermined field which consists of two or more pixels to the two-dimensional array of an image sensor 5, and stores the amendment data of G, R, and B for every block. For example, the filter array on the left-hand side of drawing 13 shows the so-called BEIYA array, 8 pixels and 4 pixels of R/B components are contained at a time in each block surrounded by the dotted line for G component, and the same value is used for the correction-by-sensitiveness data to this part for every color.
[0110] the amendment data which are equivalent to the part of block 1 as a G amendment data stream as shown in the right-hand side of drawing 13 , and the amendment data equivalent to the part of block 2 -- each amendment data is continuously stored in the HV memory 20 even to the amendment data of the last block n at the order ... It is the data array same also as an amendment data stream of R/B. Therefore, the partial sensibility nonuniformity resulting from a color filter etc. can be amended [rather than] by little HV memory 20 of capacity with the amendment data to all the pixels of an image sensor 5.
[0111] Even if, as for the sensibility nonuniformity produced by dispersion at the time of manufacture of a color filter etc., the optical conditions of photography optical system etc. generally change, a property does not change, but when the focal distance (strictly pupil posion) of photography optical system

changes, since a property changes, the component of White shading mentioned above needs to reset a value.

[0112] Next, the amendment processing in the gestalt of this operation is explained with reference to the flow chart of drawing 14 .

[0113] first, at step 60, reading appearance of the amendment data which should be set as the H memory (H1) 12 is carried out from the nonvolatile memory inside the whole control CPU 1, and it stores in the H memory (H1) 12. moreover, at step 61, reading appearance of the amendment data which should be set as the V memory (V1) 14 is carried out from the nonvolatile memory inside the whole control CPU 1, and it stores in the V memory (V1) 14. Here, the amendment data which should be set as the H memory (H1) 12 and the V memory (V1) 14 are the same as the 1-dimensional amendment data explained with the gestalt of the 1st operation, are determined according to the property of the image sensor 5 measured by the production process, and are beforehand stored in the nonvolatile memory inside the whole control CPU 1.

[0114] At step 62, the amendment data of each block 1 of an image sensor which was mentioned above - every n are read from the nonvolatile memory inside the whole control CPU 1, and it stores in the HV memory 20. Also about this amendment data, it is determined according to the property of the image sensor 5 measured by the production process, and is beforehand stored in the nonvolatile memory inside the whole control CPU 1.

[0115] In the 1st multiplication circuit (MUL1) 18, the multiplication of the value of the H memory (H1) 12 outputted when the level address i is specified by the address generation circuit 10, and the output of the A/D-conversion section 7 is carried out by the above setting out. Next, in the 2nd multiplication circuit (MUL2) 19, the multiplication of the value of the V memory (V1) 14 outputted when the vertical address j is specified by the address generation circuit 10 is carried out to the 1st multiplication circuit (MUL1) 18. The effect of White shading generated with the combination of a taking lens 4 and the micro lens of an image sensor 5 is amended by the above two actuation.

[0116] Furthermore, the multiplication of the value of the HV memory 20 outputted when horizontal / vertical address is specified by the address generation circuit 10 is carried out by the 3rd multiplication circuit (MUL3) 21 to the output of the 2nd multiplication circuit (MUL2) 19. The amendment [in which it mentioned above] data which corresponds for each [in / like / the two-dimensional array of an image sensor 5] the block of every are memorized by this HV memory 20. This amendment data can perform amendment to the partial sensibility nonuniformity of the color filter of an image sensor 5.

[0117] Next, at step 63, when it judges whether the field angle setting-out sections 3 (for example, zoom manual operation button etc.) shown in drawing 12 were operated by the operator and there is no actuation, it remains as it is, but when it succeeds in actuation, it progresses to step 64.

[0118] At step 64, the value of the focal distance information outputted from the focal distance information detecting element 2 is read. In the whole control CPU 1, from focal distance information, as shown, for example in drawing 15 , the amendment data which should be stored in the H memory (H1) 12, and the amendment data which should be stored in the V memory (V1) 14 are re-calculated according to a predetermined function.

[0119] In drawing 15 , if a focal distance is on a short focus side, in view of the amount of incident light in the circumference of a screen falling, the correction factor (gain) in the circumference will be enlarged more, and on the other hand, if it is on a long focus side, in view of change of the amount of incident light in the circumference of a screen decreasing, the difference of the correction factor in the circumference and the correction factor for a core is made small.

[0120] Therefore, the approach of carrying out the multiplication of the multiplier (function which makes a focal distance a variable) which changes by predetermined relation to a focal distance to an amendment data stream at steps 65 and 66, for example, Or by the approach of preparing for the nonvolatile memory in the whole control CPU 1 etc. beforehand by using as a table the amendment data stream prepared according to the individual to the focal distance, and choosing the amendment data stream corresponding to a focal distance from this table etc. New amendment data are obtained, and it resets in H memory (H1) and V memory (V1), and returns to step 63.

[0121] Thus, with the gestalt of this operation, to the sensibility nonuniformity of the image sensor determined according to the condition of photography optical system, it amends using the 1-dimensional each data stream for a horizontal direction and perpendicular directions, and the block which consists of two or more pixels is amended using the amendment data stream assigned by carrying out a unit to the sensibility nonuniformity of the color filter which it is at the manufacture event of an image sensor, and is generated on the other hand etc. Moreover, when the changes of state (for example, a focal distance, a pupil posion, the condition of drawing, etc.) of photography optical system occur to the component determined according to the condition of photography optical system, it amends by resetting amendment data according to the condition of each optical system.
[0122] According to the gestalt of this operation, 1-dimensional amendment data and vertical 1-dimensional amendment data with an image sensor horizontal for example, By amending the output of an image sensor combining the amendment data which consist of two or more pixels of the two-dimensional direction of an image sensor and which were determined according to the individual for every block Both partial sensibility nonuniformity, such as White shading produced mainly under the effect of optical system and a color filter produced in the production process of an image sensor, can be amended.
[0123] [Others] In addition, even if it applies this invention to the system which consists of two or more devices, it may be applied to the equipment which consists of one device.
[0124] Moreover, it cannot be overemphasized by the object of this invention supplying the storage (or record medium) which recorded the program code of the software which realizes the function of the operation gestalt mentioned above to a system or equipment, and reading and performing the program code with which the computer (or CPU and MPU) of the system or equipment was stored in the storage that it is attained. In this case, the function of the operation gestalt which the program code itself by which reading appearance was carried out from the storage mentioned above will be realized, and the storage which memorized that program code will constitute this invention. Moreover, it cannot be overemphasized that it is contained also when the function of the operation gestalt which performed a part or all of processing that the operating system (OS) which is working on a computer is actual, based on directions of the program code, and the function of the operation gestalt mentioned above by performing the program code which the computer read is not only realized, but was mentioned above by the processing is realized.
[0125] Furthermore, after the program code by which reading appearance was carried out from a storage is written in the memory with which the functional expansion unit connected to the functional expansion card inserted in the computer or a computer is equipped, it is needless to say in being contained also when the function of the operation gestalt which performed a part or all of processing that the CPU with which the functional expansion card and functional expansion unit are equipped based on directions of the program code is actual, and mentioned above by the processing is realized.
[0126]
[Effect of the Invention] According to this invention, the heterogeneity of the sensibility of an image sensor is amended good, for example.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] As opposed to the line of the image sensor with which it is image pick-up equipment, and the pixel was arranged two-dimensional, and the image picturized by said image sensor As opposed to the 1st multiplication means which multiplies by horizontal 1-dimensional amendment data, and the train of said image The 2nd multiplication means which multiplies by vertical 1-dimensional amendment data, and a modification means to change either [at least] said horizontal 1-dimensional amendment data or the 1-dimensional amendment data of said perpendicular direction according to the location of the attention pixel in said image, Image pick-up equipment characterized by amending the value of each pixel of said image with a preparation, said 1st multiplication means, and the 2nd multiplication means.
[Claim 2] It is image pick-up equipment according to claim 1 which said image is divided into two or more subregions, and is characterized by changing said modification means according to the subregion where an attention pixel belongs in either [at least] said horizontal 1-dimensional amendment data or the 1-dimensional amendment data of said perpendicular direction.
[Claim 3] It is image pick-up equipment according to claim 1 which, as for said image, two or more subregions are divided, and is characterized by said modification means changing the both sides of said horizontal 1-dimensional amendment data and the 1-dimensional amendment data of said perpendicular direction according to the subregion where an attention pixel belongs.
[Claim 4] Said modification means is image pick-up equipment according to claim 1 characterized by having two kinds of horizontal 1-dimensional amendment data, and presenting a switch and the multiplication processing by said 1st multiplication means with 1-dimensional amendment data horizontal by turns per line.
[Claim 5] Said modification means is image pick-up equipment according to claim 1 or 4 characterized by having 1-dimensional amendment data of two kinds of perpendicular directions, and presenting a switch and the multiplication processing by said 2nd multiplication means with vertical 1-dimensional amendment data by turns in a train unit.
[Claim 6] Said image sensor is image pick-up equipment according to claim 4 or 5 characterized by including the color filter of a BEIYA array.
[Claim 7] Said image is respectively divided into two or more groups who consist of a field where two or more pixels were arranged two-dimensional, and each group is received. It is image pick-up equipment given in any 1 term of claim 1 which is further equipped with the 3rd multiplication means which multiplies by the two-dimensional amendment data given in procession, and is characterized by said modification means including a means to change said two-dimensional amendment data according to the group to whom the attention pixel in said image belongs thru/or claim 6.
[Claim 8] Said modification means is image pick-up equipment given in any 1 term of claim 1 characterized by including a means to change either [at least] said horizontal 1-dimensional amendment data or the 1-dimensional amendment data of said perpendicular direction, according to the condition of image pick-up optical system thru/or claim 7.
[Claim 9] Said modification means is image pick-up equipment given in any 1 term of claim 1

characterized by including a means to change either [at least] said horizontal 1-dimensional amendment data or the 1-dimensional amendment data of said perpendicular direction, according to either or such combination of the focal distance of image pick-up optical system, a field angle, and drawing thru/or claim 7.

[Claim 10] Are the image processing system which processes the image supplied from the image sensor with which the pixel was arranged two-dimensional, and the line of said image is received. As opposed to the 1st multiplication means which multiplies by horizontal 1-dimensional amendment data, and the train of said image The 2nd multiplication means which multiplies by vertical 1-dimensional amendment data, and a modification means to change either [at least] said horizontal 1-dimensional amendment data or the 1-dimensional amendment data of said perpendicular direction according to the location of the attention pixel in said image, The image processing system characterized by amending the value of each pixel of said image with a preparation, said 1st multiplication means, and the 2nd multiplication means.

[Claim 11] As opposed to the line of the image picturized by the image sensor by which it is the image-processing approach and the pixel was arranged two-dimensional As opposed to the 1st multiplication process which multiplies by horizontal 1-dimensional amendment data, and the train of said image The 2nd multiplication process which multiplies by vertical 1-dimensional amendment data, and the modification process which changes either [at least] said horizontal 1-dimensional amendment data or the 1-dimensional amendment data of said perpendicular direction according to the location of the attention pixel in said image, The image-processing approach characterized by amending the value of each pixel of said image according to an implication, said 1st multiplication process, and the 2nd multiplication process.

[Claim 12] It is the memory medium which stored the image-processing program. This program As opposed to the line of the image picturized by the image sensor by which the pixel was arranged two-dimensional As opposed to the 1st multiplication process which multiplies by horizontal 1-dimensional amendment data, and the train of said image The 2nd multiplication process which multiplies by vertical 1-dimensional amendment data, and the modification process which changes either [at least] said horizontal 1-dimensional amendment data or the 1-dimensional amendment data of said perpendicular direction according to the location of the attention pixel in said image, The memory medium characterized by amending the value of each pixel of said image according to an implication, said 1st multiplication process, and the 2nd multiplication process.

[Translation done.]